

SUMMARY OF THE INVENTION

[0004] It is therefore an object of the present invention to provide an intravascular blood pump for percutaneous insertion having a catheter which can be prevented from kinking.

5 **[0005]** This object is achieved according to the present invention by a blood pump for percutaneous insertion having the features of independent claim 1. Preferred embodiments and further developments of the invention are specified in the claims dependent thereon. Throughout this disclosure, the term “distal” will refer to directions away from a user and towards the heart, whereas the term “proximal” will refer to
10 directions towards a user.

[0006] According to the invention, the catheter of an intravascular blood pump for percutaneous insertion comprises an elongate stiffening structure that extends continuously longitudinally along the length of the catheter between the proximal end and the distal end of the catheter. The stiffening structure has a bending stiffness of
15 about 0.00005 Nm^2 to about 0.01 Nm^2 , preferably about 0.0001 Nm^2 to about 0.001 Nm^2 , more preferably about 0.0001 Nm^2 to about 0.0005 Nm^2 , more preferably about 0.0001 Nm^2 to about 0.0007 Nm^2 or about 0.00005 Nm^2 to about 0.0004 Nm^2 , and is not subject to plastic deformation if bent with a minimum bending radius 10 mm. The catheter is, thus, reinforced by means of the elongate stiffening structure and prevented
20 from kinking.

[0007] In one embodiment, the stiffening structure comprises a shape-memory material. The continuous stiffening structure of a shape-memory material prevents the catheter from kinking while at the same time providing sufficient flexibility to enable bending so that the catheter can be directed through a blood vessel, such as the aorta.
25 This is particularly caused by so-called superelastic properties of the material. Shape memory materials have temperature dependent properties and temperature independent properties. Shape memory is a temperature dependent property that allows the shape memory material the ability to undergo deformation at one temperature and then recover

CLAIMS

1. An intravascular blood pump for percutaneous insertion into a patient's blood vessel, comprising a catheter (10) and a pumping device (1) attached to the catheter (10), the catheter (10) extending along a longitudinal axis and having a distal end (11) and a proximal end (12) opposite the distal end (11) along the longitudinal axis, the catheter (10) comprising an elongate stiffening structure (15) extending continuously longitudinally along the length of the catheter (10) between the proximal end (11) and the distal end (12) of the catheter (10), wherein the stiffening structure (15) has a bending stiffness of 0.00005 Nm^2 to 0.01 Nm^2 and is not subject to plastic deformation if bent with a minimum bending radius 10 mm.
2. The blood pump of claim 1, wherein the catheter (10) has at least one lumen (13) that extends through the catheter (10) from the proximal end (12) to the distal end (11), with the stiffening structure (15) being disposed in the lumen (13) of the catheter (10).
3. The blood pump of claim 2, wherein the stiffening structure (15) is loose inside the lumen (13) of the catheter (10).
4. The blood pump of any one of claims 1 to 3, wherein the stiffening structure comprises at least one rod or wire (15).
5. The blood pump of any one of claims 1 to 4, wherein the stiffening structure comprises a plurality of rods or wires (15B).
6. The blood pump of claim 4 or 5, wherein the at least one rod or wire (15) is solid.
7. The blood pump of any one of claims 4 to 6, wherein the at least one rod or wire (15) has a diameter of 0.3 to 0.6 mm, preferably about 0.5 mm.
8. The blood pump of any one of claims 4 to 7, wherein a cross-section of the at least one rod or wire (15) is not rotationally symmetric, wherein the cross-section of the at least one rod or wire (15) has preferably at least two intersecting axes of symmetry.
9. The blood pump of any one of claims 4 to 8, wherein the at least one rod or wire (15) is straight.

10. The blood pump of any one of claims 5 to 9, wherein the plurality of rods or wires are braided.
11. The blood pump of any one of claims 1 to 10, wherein the bending stiffness of the stiffening structure (15) varies with respect to bending of the stiffening structure (15) in
5 different planes.
12. The blood pump of claim 11, wherein the catheter (10) is curved in a plane and wherein the stiffening structure (15) has a minimum bending stiffness with respect to bending in said plane in which the catheter (10) is curved.
13. The blood pump of any one of claims 1 to 12, wherein the stiffening structure (15)
10 comprises a shape-memory material, preferably Nitinol.
14. The blood pump of any one of claims 1 to 13, wherein the stiffening structure (15) is configured to stay in the catheter (10) during operation of the blood pump.
15. The blood pump of any one of claims 1 to 13, wherein the stiffening structure (15) is configured to be removed from the catheter (10) after placement of the blood pump in
15 a patient's body.